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Robert A. Kramer is the NiSource Charitable Foundation Professor of Energy and the Environment, Professor of Physics, and Director of the Energy Efficiency and Reliability Center (EERC) at Purdue University Northwest. In this role Prof. Kramer is involved in the development of research programs in energy utilization and efficiency, building energy efficiency, electric power, reliability, electric transmission, renewable energy sources including hydrogen production from biomass, coal gasification for the production of liquid transportation fuels and fertilizer, advanced control of large industrial loads, nuclear reactor analysis, and combined heat and power systems. He is also a Certified Energy Manager, a Certified Demand Side Manager, and a Certified Energy Auditor with the Association of Energy Engineers. He teaches various courses in Physics and Engineering.

Prof. Kramer's approach to research and teaching are inseparably intertwined with a desire to produce value for the community and students as well as assisting in the discovery and development of new and effective ways, in a sustainable and environmentally compatible manner, to assure the future availability and reliability of both existing and new energy resources. One of the most important issues facing the world, both now and in the future, is providing adequate sources of energy in a technologically feasible, economic, and environmentally acceptable manner. One major aspect in addressing these issues is to provide well designed and technically valid educational opportunities that produce tangible value for students to pursue careers in the energy field.

Prof. Kramer started the Energy Efficiency and Reliability Center at PNW, which is entirely self-funded, in 2004 in an effort to assist in providing new energy research and to provide a value based educational opportunity for students in the energy field. Prof. Kramer has designed and teaches five experientially oriented energy courses that include topics in energy engineering, associated science, nuclear science, and renewable resources and their optimization as part of a total energy system. He has redesigned three other Physics courses to improve their value to students for their future pursuits in either graduate school or the workplace. This redesign was based upon providing the essential skills required, at an appropriate level, such that the students have a competitive degree of expertise relative to other students in the associated discipline in general. He periodically conducts energy audits and energy efficiency design activities for local businesses, municipalities, and community organizations. These activities include students at both the undergraduate or graduate level depending on the nature of the effort. Prof. Kramer's students participate in conducting energy audits and help make associated energy optimization recommendations for a wide range of facilities ranging from a hotel in Florida to industrial and school facilities in Northwest Indiana.

Prior to coming to Purdue University Calumet Prof. Kramer was the Chief Scientist for NiSource Energy Technologies and most recently was responsible for technical developments of new energy technologies including Combined Heat and Power and building energy optimization systems. He was at NiSource from 1973 until January 2004 and held the positions of Nuclear Fuel Engineer, Manager Applied Research, Manager Strategic Planning, Manager Technical Support, Director of Electric Engineering and Applied Research, Director of Electric Operations, Director of Electric Services, Vice President and Chief Scientist. During this time, he also taught a variety of courses in Physics and Electronics at Purdue University Calumet and Indiana University Northwest.

Prof. Kramer has conducted a variety of energy and energy efficiency research and development projects and programs. These projects range from enhancing reliability of bulk electric transmission systems to high efficiency local generation sources utilizing Combined Heat and Power that generate electricity locally and use byproduct heat to achieve high levels of system efficiency as well as nuclear power research. Energy sources such as microturbines, reciprocating engines, fuel cells, solar, coal, hydrogen, and biomass are considered in this work. Current research efforts include: research and design of high efficiency lighting systems; advanced control schemes utilizing neural networks and fuzzy logic in a feed forward configuration for industrial as well as commercial and building applications; wireless communications and control; production of liquid transportation fuels, fertilizer, coke, and bulk hydrogen from coal; biological production of hydrogen; control of large industrial loads to improve electric transmission system reliability; combined heat and power; industrial energy efficiency; building energy efficiency; renewable energy systems; nuclear reactor engineering analysis; electric, thermal, and renewable energy system design, integration, and optimization for large data centers; thermal coating design and efficiency; and optimization and production of hydrogen from an aluminum-water process. Commercial and industrial energy audits, with student participation, are routinely performed to enhance the value of energy as well as considering methods to optimize total energy value through the use of combinations of renewable and conventional energy options.

A study of the feasibility, technology, and value of using new lighting technology is ongoing with ten communities in conjunction with a local utility. Testimony in this regard was presented by Prof. Kramer in support of a utility rate case with the Indiana Utility Regulatory Commission (IURC). Currently Prof. Kramer is actively working to appraise and test potential LED lighting devices and he is currently collaborating on the development of specifications, standards, and rates for LED street lighting. Prof. Kramer also presented testimony regarding LED Street Lighting for another utility Rate Case before the IURC as well as several other filings. Prof. Kramer is currently evaluating modern lighting luminaires from 25 different vendors and has an ongoing vendor qualification program based of quality of light, power quality, reliability, and life cycle cost based on a probabilistic model developed in house and benchmarked against industry standards. A research effort has recently been funded and initiated to consider design and installation optimization of aspects of LED highway lighting including performance, light level and distribution, and community opinion considerations to maximize economic, societal, and technical benefits as part of community enhancement activities. A new effort to consider Community Solar applications, designs, and implementation, in conjunction with eight communities, has been initiated.

Prof. Kramer's research activities, which involve both undergraduate and graduate student participation, consider a total of nine different research concentrations. A new discovery

was made as part of this research that has led to the filing of a new patent application for a process involving production of hydrogen from food waste at greatly increased levels. A new research and design effort to enhance the thermal and electric efficiency and power reliability of a large data center in associated with an economic development center located in Indiana are ongoing. This effort is now considering ongoing work to simultaneously optimize renewable and gas based generation resources and demand response options. A new effort has been initiated for the development of a modular energy system will be used as part of community development activities in Indiana and Illinois. This effort will consider multiple uses of energy for the delivery of high reliability/quality electric/thermal power as well as integrating advances in renewable resources and commercial economic development efforts for the surrounding community. In addition, it is anticipated that a distributed generation system based on use of biological production of hydrogen (as described previously) employing a byproduct of ethanol production (DDGS) may be included in this development effort in the future. Two other potential applications of this technology for commercialization have also been identified and are now being pursued for further development. New efforts for commercialization of the two coal gasification patents issued recently for a new process developed to enhance the value of coal by adding additional value streams, including production of liquid transportation fuels, as part of the coke production process used by the steel and foundry industries have been initiated and include enhanced environmental emissions reduction. Interest in the process has been expressed by a potential developer. Discussions for possible commercialization are ongoing. These efforts were correlated with Purdue Research Foundation for the commercialization effort and handling of the intellectual property issues. Prof. Kramer has served as the principal investigator for research grants and contracts with a total value over $10,000,000 as well as being one of the co founders of the Center for Advanced Control of Electric Power Systems funded by the National Science Foundation and the Electric Power Research Institute.

Prof. Kramer has participated in a variety of industry committees including the Coordination Review Committee (CRC) for the East Central Area Reliability Council (ECAR), the Research Advisory Committee (RAC) for the Electric Power Research Institute (EPRI), the Basic Science Committee of the Gas Research Institute, and the Control Criteria Task Force, Performance Subcommittee and other committees of the North American Electric Reliability Council. He is a former president of the Calumet Engineering Education Association.

He is a Senior Member of The Institute of Electrical and Electronics Engineers (IEEE) and The Association of Energy Engineers (AEE). He is also a member of the American Physical Society (APS), Illuminating Engineering Society (IES), American Nuclear Society (ANS), American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE), the Association of Iron and Steel Engineers (AISE), and the Sigma Pi Sigma physics honorary.

Dr., Kramer received a Ph.D. (1985) and M.S. (1979) in Nuclear Engineering from Purdue University, West Lafayette, Indiana, and B.S. (1971) and M.S. (1973) degrees in Physics, also from Purdue University, West Lafayette.

Dr. Kramer has published numerous papers regarding energy system design and efficiency, energy markets, electric system operation, reliability, and Combined Heat and Power. He has made numerous presentations regarding energy related technology, analysis, and policy. He also holds various patents. A listing of his publications and patents follows;

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